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A BRIEF SURVEY OF LENGTH-WEIGHT RELATIONSHIP IN GIBEL CARP (*CARASSIUS GIBELIO* BLOCH, 1782) FROM CIŞMIGIU LAKE

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Abstract

A fishing survey conducted at the end of October 2014 in Cişmigiu Gardens from Bucharest, revealed that length - weight relationship (LWR) in the cyprinid Carassius gibelio was influenced both by environmental conditions and small length range of specimens caught.
The LWR for a total of 94 unsexed Gibel carp, examined from the very next day of sampling was calculated as: TW = 0.0055 TL $^{3.6303}$. Similar with other biometric case studies conducted on this species in the specialized literature, our report has limitations like narrow-sized specimens, but this is because in sample season, the fish had not yet reached full maturity. However, to our knowledge, this is the first contribution on length-weight relationship for Carassius gibelio belonging to an anthropic lake from Bucharest.

Key words*: Carassius gibelio, Cişmgiu Lake, length-weight relationship.*

INTRODUCTION

Length-weight relationships play an important role in fish biology (Froese et al., 2011; Zargar et al., 2012). LWR enables morphological comparisons between different fish species or populations from different habitats (Sangun et al., 2007).
Carassius gibelio Bloch, 1782 (Prussian carp or Gibel carp), a cyprind fish species spread in Europe, Siberia and Northeast Asia (De Giosa et al., 2014) was relatively few studied in Romania from biometric perspective, most studies focusing on the Danube populations (Gheorghe et al., 2012).
Here we aim to present such observations on gibel carp, a fish species introduced in the oldest public garden from Bucharest. From ecological point of view, Cişmigiu Lake is a young lacustrian ecosystem, artificially maintained through water emptying and the mud drainage in winter months (Zinevici et al., 2001), and this was the season when we easily collected the fish specimens.

MATERIALS AND METHODS

Overall, 94 specimens of Gibel carp were caught with the aid of a fishnet from Cişmigiu Lake on October 22, 2014. Sampling was carried out in three different points: near Monte Carlo Restaurant ($44^0$26'15" N, $26^0$05'22" E), Walnut Bridge ($44^0$26'16" N, $26^0$05'27" E) and Stone Bridge ($44^0$26'12" N, $26^0$05'30" E) (Figure 1). Fish specimens were preserved frozen and analyzed during the next three days in our laboratory from UASVM of Bucharest (Figure 2).
For each fish, the total weight in grams (TW ± 1 g) and the total length in cm (TL ± 1 mm) were measured. The length-weight relationship (LWR) was expressed as: $TW=aTL^b$, where *a*

(the intercept of the logarithmic form) describes the rate of change of weight with length and seasonal parameter *b* (the slope of the regression line in the logarithmic form) provides information about the type of growth (Froese, 2006; Sangun et al., 2007). The equation was log transformed (Log TW= Log a + b Log TL) to estimate the two coefficients of LWR. The b values should be within the expected range of 2.5-3.5 (Froese, 2006). When b > 3, positive allometric pattern of growth occurs, this means that the fish grows faster in weight than in length (Karachle and Stergiou, 2012). The slope and intercept were estimated with a nonlinear regression, by the least-square method, using PAST (Paleontological Statistics Software) version 3.04.

Figure 1. Sample stations from Cişmigiu Lake, Bucharest

Figure 2. Gibel carp specimens from Cişmigiu Lake

RESULTS AND DISCUSSIONS

In our fish sample, the TL ranged from 3.7 to 10.8 cm, with a mean of 5.283 cm. The TW ranged from 1.00 to 23.00 grams, with a mean of 3.394 grams. All specimens proved to be juveniles and were not sexed in this analysis.

The linear regression of the log-transformed values was calculated as: Log (TW) = - 2.2581 + 3.6303L Log (TL), with a value of 0.913 for the determination coefficient (r^2), at 95% confidence limits of the parameters *a* and *b* (Figure 3).

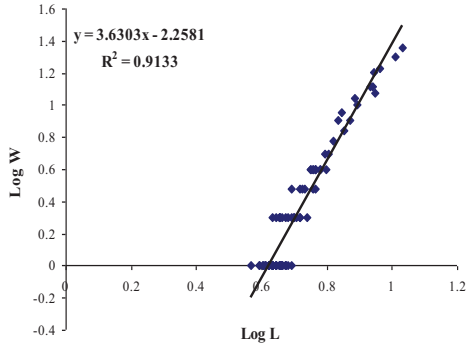

Figure 3. Least square regression of Log W x Log L for gibel carp sampled from Cişmigiu Lake, October 2014

The corresponding nonlinear equation, showing the weight-length relationship was represented by: $TW = 0.0055 \times TL^{3.6303}$ (Figure 4). Growth type for gibel carp juveniles was determined as positive allometric, since parameter *b* has a value greater than 3.

The slope value recorded for *Carassius gibelio* from Cişmigiu Lake exceeded the maximum value reported by FishBase for this species in the Romanian waters (www.fishbase.org).

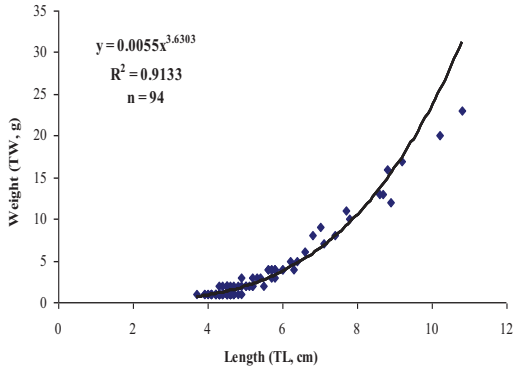

Figure 4. Relationship between length and weight for gibel carp sampled from Cişmigiu Lake, October 2014

The high value of *b* is often related to small length range of specimens caught (Froese, 2006; Treer et al., 2011). Actually, in our case, the overestimation of the slope may be due to the fact that fish sample did not coverd, by chance, the full size ranged, as recommended (Froese et al., 2011), although the lake was randomly sampled. Thus, with few exceptions, most gibel carp from Cişmigiu Lake seemed to be immature when they were caught.

Also, the exponent *b* may vary with trophic state of the lake, with low values in eutrophic rather in oligotrophic lakes (Tsoumani et al., 2006). Hence, in the absence of chemical analysis of the water, our high value of parameter *b* in the LWR might suggest the presence of an oligotrophic lake. Yet again, having fish with an average length slightly above 5 cm, we can not rush to any conclusions in this regard.

The anthropic lake from Cişmigiu Garden is filled every year by omnivorous fish like *Carassius gibelio*. For one- and two- year old gibel carp, green and blue-green algae are dominant in food spectrum, while older specimens preferr the zooplankton, like copepods (Rogozin et al., 2011).

In eutrophic lakes, the zooplankton is reduced, which correlates to fish growth (Treer et al., 2010). Studies regarding the seasonal dynamics of Cişmigiu Lake zooplankton (Zinevici et al., 2001), showed that the minimum value of diversity was riched in October, meaning the exactly same month of the year when we sampled the gibel carp. This last aspect might explain why fish were represented by almost only young specimens in all three stations from the studied lake.

On the other hand, sample season might influence the weight-length relationship (Bobori et al., 2010; De Giosa et al., 2014). Although the *b*-value seems to be in general significantly lower than 3, indicating hypoallometric growth for *Carassius gibelio* recorded in cold season (De Giosa et al., 2014), it should not be forgotten that our sample was formed by very small fish specimens. Small range of the gibel carp sample could be linked with the environmental conditions, in that small amounts of food are available in cold month of the year.

Interpretation of present results it should also take into account that most of the LWR studies on *Carassius gibelio* have dealt before with natural reservoirs, not anthropic areas.

Only one study reported, so far, the presence of *Carassius gibelio* in Cişmigiu Garden (Gavriloaie, 2008). Aside from gibel carp, brown bullhead is another naturalized species in the fauna of Cişmigiu Lake, a few specimens of *Ictalurus nebulosus* being caught during this brief survey.

As a result of water emptying of the lake in this part of the year, if it had not been collected, the fish would have come anyway on garbage, food for gulls or simply would be frozen due to the low temperatures recorded in the sampling season.

CONCLUSIONS

The LWR of *Carassius gibelio* sampled from Cişmigiu Lake, determined from regression of Log weight on Log length, indicated a positive allometric type of growth.

However, our results should first be interpreted within the context of a very small-sized of fish caught, which implies that majority of gibel carp sampled in October did not reach the maturity age. Compared with previously case studies on gibel carp biometry, the *b*-value reported in this survey should be considered an example of how narrow length range of fish may influence the LWR results.

For further analysis, we intend to observe the evolution of LWR and the condition factor of gibel carp over a full year, covering all seasons. Also, biometric parameters of the fish will be correlated with sex specimens and physico-chemical features of the water that will reveal the real trophic state of the lake.

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